

Remarks

This Preliminary Amendment cancels without prejudice original claims 1 to 3 in the underlying PCT Application No. PCT/DE03/02513. This Preliminary Amendment adds new claims 4-7. The new claims, inter alia, conform the claims to United States Patent and Trademark Office rules and do not add new matter to the application.

In accordance with 37 C.F.R. § 1.125(b), the Substitute Specification (including the Abstract, but without the claims) contains no new matter. The amendments reflected in the Substitute Specification (including Abstract) are to conform the Specification and Abstract to U.S. Patent and Trademark Office rules or to correct informalities. As required by 37 C.F.R. § 1.121(b)(3)(ii) and § 1.125(c), a Marked Up Version Of The Substitute Specification comparing the Specification of record and the Substitute Specification also accompanies this Preliminary Amendment. Approval and entry of the Substitute Specification (including Abstract) are respectfully requested.

The underlying PCT Application No. PCT/DE03/02513 includes an International Search Report, dated November 21, 2003, a copy of which is included. The Search Report includes a list of documents that were considered by the Examiner in the underlying PCT application.

Applicants assert that the subject matter of the present application is new, non-obvious, and useful. Prompt consideration and allowance of the application are respectfully requested.

Respectfully Submitted,
KENYON & KENYON

Dated: 4/18/05

By: *for Rich Mayer* (by *[Signature]*
Richard L. Mayer
Reg. No. 22,490)
12.10.36,197)
One Broadway
New York, NY 10004
(212) 425-7200

CUSTOMER NO. 26646

[10191/3504]

ELECTRICAL CONTACTING OF THIN ENAMELED WIRES OF SECONDARY
WINDINGS OF IGNITION COILS

Field of the Invention

The present invention relates to an electrical connection set-up for manufacturing an ignition coil, particularly a rod-type
5 ignition coil having an ignition coil rod with a high-voltage outlet as well as a low-voltage outlet.

Background Information

- 10 Ignition coils produce high-voltage sparks. This spark jumps between the electrodes of the spark plug set up at the ignition coil, thus igniting the air-gasoline mixture of an internal combustion engine, for example. Normally, this spark plug is supplied with high voltage from an ignition coil. A
15 primary winding and a corresponding secondary winding are provided within the ignition coil. At one end, the primary winding is connected to an ignition switch, while its other end is connected to a so-called contact breaker.
- 20 The secondary winding, that is, the winding responsible for generating the ignition spark, is connected in the interior of the ignition coil to the one end of the primary winding, so that it is grounded. The other end of the secondary winding is connected to the high-voltage outlet, which in turn is either
25 connected to an ignition cable leading to the spark plug, or at which outlet the spark plug is set up directly.

The secondary winding itself is made of a thin wire coated with a suitable layer of enamel so as to avoid the contacting

of the individual wires when wrapping a specific support part or coil shell. Once the secondary windings have been wound onto a shell, the ends of the respective wires are contacted. Normally, thermal contacting methods such as soldering or
5 welding, for example, are ~~known~~used for this purpose.

~~Disadvantages of the Related Art~~

Different work processes are required especially with regard
10 to contacting the primary and secondary windings in accordance with conventional methods. This entails higher installation costs, multiple assembly steps and also a certain number of connecting parts necessary to make an appropriate electrical connection.

15 Furthermore, in such a tight installation space, it ~~was~~is often difficult to bring about an appropriate contacting using the known thermal methods.

~~Object of the Invention~~

The~~An~~ object of the present invention is to provide a connection set-up between an ignition coil rod of an ignition coil and a secondary or primary winding which is inexpensive
25 and readily implemented.

~~Attainment of the Objective~~

Summary

30 ~~The basic principle for achieving the objective is to replace the thermal contacting method known per se from the related~~

~~art. This is achieved by providing~~In accordance with the
present invention, additional contacting elements that break
through the insulation of the enamel-coated wire of the
secondary winding during installation are provided, thus
5 bringing about an appropriate contacting.

~~Summary of the Invention~~

In particular, it may be seen as an advantage for the
10 electrical connection set-up for producing an ignition coil
that the contacting according to the present invention is
integrated into already existing components and may be
reliably produced using simple processes.

15 Compared to the ~~previous~~conventional method, the "cold"
contacting method proposed here has the advantage that it
involves no additional installation costs. In addition, the
set-up of the present invention makes it possible to reduce
the number of assembly steps and the number of connecting
20 parts.

A further substantial advantage of the present invention is
that the implementation of the contacting does not require
optimization of the installation space. This means that it is
25 not necessary to reserve a free space in the area of
contacting, e.g., for electrode holders, soldering irons or
the like.

According to the present invention, on the side of the low-
30 voltage outlet, a contact spring is inserted via guide means,
the contact spring gliding over a nose-like element when being

inserted, so that the contact spring may be guided over the secondary winding without initially touching it.

Upon reaching a defined position provided by an opening or recess on the side of the contact spring, the nose-like element snaps into this opening, so that the contact spring rests on the secondary winding.

On the side of the contact spring facing the coil shell, contact elements are provided which press on the insulated wires of the coil shell during the snapping process and which, due to this snapping process, break the insulation at the corresponding contact points, so that an electrical contact can be established between the individual wires of the coil shell and the contact spring.

~~Further advantageous embodiments will become apparent from the following description as well as the drawings and the claims.~~

~~Brief Description of the Drawings~~

~~The figures show:~~ Brief Description of the Drawings

Fig. 1 shows a A perspective view of an ignition coil having one side for the high-voltage outlet and another side for the low-voltage outlet.

Fig. 2 shows a A sectional view through the ignition coil according to Fig. 1.

Fig. 3 shows a A perspective view of an ignition coil rod located in the ignition coil housing shown in Fig. 1.

Fig. 4 shows a A perspective view of the side of the low-voltage outlet of an ignition coil₇.

5 Fig. 5 shows a A perspective view of the ignition coil rod, ~~in particular of~~on the side of the low-voltage outlet featuring a contact spring₇.

Fig. 6 shows a A perspective view of an enlarged
10 representation of the side of the low-voltage outlet of the ignition coil rod featuring a contact spring in a position prior to installation₇.

Fig. 7 shows a A cross section through the ignition coil rod
15 according to Fig. 5₇.

Fig. 8 shows an ~~An~~ enlarged representation of the sectional view according to Fig. 7₇.

20 Fig. 9 shows a A perspective view of the contact spring according to the present invention for installation on the side of the low-voltage outlet₇.

Fig. 10 shows an ~~An~~ enlarged representation of the contact
25 spring according to Fig. 9.

~~Description of an Exemplary Embodiment~~ Detailed Description

Fig. 1 shows a perspective view of an ignition coil 1.
30 Ignition coil 1 includes an ignition coil housing 2 and an ignition coil rod 3 located in ignition coil housing 2. In addition, ignition coil 1 features a side for a high-voltage

outlet H and a side for the low-voltage outlet N. The side of low-voltage outlet N is provided to establish contact with a power supply not detailed in the drawing, while the side of high-voltage outlet H is provided for connecting to an
5 ignition cable or a spark plug not detailed in the drawing.

Fig. 2 shows a sectional view of ignition coil 1 represented in Fig. 1, the areas shown relating to ~~essential~~ features of the present invention represented in more detail in the
10 subsequent figures.

Fig. 3 shows ignition coil rod 3 having one side for high-voltage outlet H and one side for low-voltage-outlet N, which, immediately following its assembly, is insertable as a unit
15 into ignition coil housing 2 represented in Fig. 1 and Fig. 2.

Fig. 4 shows an enlarged representation of the side of low-voltage outlet N of an ignition coil 1. A wire is wound onto a coil shell 4, resulting in secondary winding 5 provided here.
20 One end of the wire of secondary winding 5 is attached to a so-called tie-up post 6, from which the wire is wound on the peripheral surface of coil shell 4 and extends over a defined contact area. This contact area at the same time serves as contacting area 7 for a contact spring 8, shown in Fig. 5
25 through Fig. 9, for establishing an electrical contact between secondary winding 5 and contact spring 8 itself.

Once secondary winding 5 has been produced on coil shell 4, secondary winding 5 covers contacting surface 7 completely.
30 Subsequently, contact spring 8 is slid via guide means 10 in the direction of arrow 9 according to Fig. 8. In this context, contact spring 8 glides on a surface 11 of ignition coil rod 3

until reaching a nose-like element 12 (see Figs. 4 and 6).
Contact spring 8 continues to glide on this nose-like element
12, so that it is guided at a distance to coil shell 4 shown
in Fig. 8, i.e. at a distance to secondary winding 5. Once
5 contact spring 8 reaches a defined position, nose-like element
12 penetrates an opening 13 of contact spring 8 shown in Fig.
9 and 10, so that the bottom side 14 of contact spring 8 rests
completely against secondary winding 5. Contact elements 15,
which are likewise located on bottom side 14 of contact spring
10 8, break through the insulating layer of secondary winding 5
and ensure that an electrical contact is established between
contact spring 8 and secondary winding 5. Thus, an electrical
connection ~~has been~~is established without use of a thermal
method.

~~Abstract~~

ABSTRACT

~~The present invention relates to an~~An electrical connection set-up for manufacturing an ignition coil is provided, which ~~is to replace current contacting methods for connecting thin~~
5 ~~enameled wires in ignition coils such as thermal methods, for example.~~

~~The objective of the present invention is achieved in that~~
includes, on the side of the low-voltage outlet ~~(N)~~, a contact spring ~~(8)~~ ~~is provided~~ which is installed by being lifted over
10 corresponding secondary windings without touching them and which then snaps into place due to ~~the~~ spring-like form or support, while elements provided on the contact spring ~~(8)~~ break through an insulating layer surrounding the secondary winding, thus establishing the electrical connection without
15 the use of thermal methods.

~~(Fig. 6)~~

INTERNATIONALER RECHERCHENBERICHT

Internationales Aktenzeichen

PCT/DE 03/02513

A. KLASSIFIZIERUNG DES ANMELDUNGSGEGENSTANDES

IPK 7 H01F38/12 H01F5/04 H01F41/10

Nach der Internationalen Patentklassifikation (IPK) oder nach der nationalen Klassifikation und der IPK

B. RECHERCHIERTE GEBIETE

Recherchierter Mindestprüfstoff (Klassifikationssystem und Klassifikationssymbole)

IPK 7 H01F H01R

Recherchierte aber nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Gebiete fallen

Während der internationalen Recherche konsultierte elektronische Datenbank (Name der Datenbank und evtl. verwendete Suchbegriffe)

EPO-Internal, WPI Data, PAJ

C. ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
Y	US 4 918 419 A (IDA YASUHIKO) 17. April 1990 (1990-04-17) Spalte 4, Zeile 6 - Zeile 68; Abbildungen 6A-6C (Col. 4, line 6 - line 68; Figures 6A-6C)	1-3
Y	US 3 533 054 A (MANCINI THOMAS ET AL) 6. Oktober 1970 (1970-10-06) Spalte 2, Zeile 56 - Spalte 3, Zeile 17; Abbildungen 1-4 (Col. 2, line 56 - Col. 3, line 17; Figures 1-4)	1-3
A	US 4 721 935 A (GUNNELS WILLIAM F ET AL) 26. Januar 1988 (1988-01-26) Spalte 3, Zeile 23 - Zeile 47; Abbildungen 4A, 4B (Col. 3, line 23 - line 47; Figs. 4A, 4B)	1, 3

☐ Weitere Veröffentlichungen sind der Fortsetzung von Feld C zu entnehmen

☒ Siehe Anhang Patentfamilie

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Europäisches Patentamt, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Bevollmächtigter Bediensteter

Marti Almeda, R

EV 321 888 491 US

INTERNATIONALER RECHERCHENBERICHT

Angaben zu Veröffentlichungen, die zur selben Patentfamilie gehören

Internationales Aktenzeichen

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Im Recherchenbericht angeführtes Patentdokument		Datum der Veröffentlichung	Mitglied(er) der Patentfamilie	Datum der Veröffentlichung
US 4918419	A	17-04-1990	KEINE	
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			US 4835841 A	06-06-1989